Progress Toward Standards

High School

Mathematics

Framework

1/13/03

Strand 1: Numbers and Operations

Standard 1.1: Students demonstrate understanding of number concepts.

In the high school test, understanding is demonstrated with the following indicators as well as by solving problems, reasoning, communicating, representing, and making connections based on the indicators—

- translating among forms for expressing numbers with large and small magnitudes, including scientific notation
- interpreting exponents and roots
- recognizing and generating equivalent forms of real numbers
- ordering real numbers
- determining numbers belonging to various subsets of the real number system and recognizing the relationships among the subsets, e.g., whole numbers, rational numbers, real numbers
- reasoning with regard to relationships among whole numbers, e.g., multiples, factors, primes, and divisibility

Standard 1.2: Students demonstrate an understanding of the concepts of operations.

In the high school test, understanding is demonstrated with the following indicators as well as by solving problems, reasoning, communicating, representing, and making connections based on the indicators—

- judging the effects that operations have on real numbers, including operations involving exponents and roots
- applying the commutative, associative, identity, inverse, distributive, and closure properties

Standard 1.3: Students demonstrate fluency in computing and estimating.

In the high school test, fluency is demonstrated with the following indicators as well as by solving problems, reasoning, communicating, representing, and making connections based on the indicators—

- performing addition, subtraction, multiplication, and division with real numbers
- applying correct order of operations and laws of exponents
- solving problems involving ratios, proportions, and percents
- estimating based on the operations described above

Strand 2: Algebra

Standard 2.1: Students demonstrate understanding of patterns, relations, and functions.

In the high school test, facility is demonstrated with the following indicators as well as by solving problems, reasoning, communicating, representing, and making connections based on the indicators—

- representing rules for real life and mathematical patterns, both those that can be explicitly defined and those that need to be defined recursively, using words, algebraic expressions, or equations
- drawing conclusions and making predictions based on patterns and relationships, both mathematical and from real life
- recognizing functions represented by verbal descriptions, equations, tables, or graphs as linear, non-linear, or exponential

Standard 2.2: Students demonstrate the ability to use algebraic symbols to represent and analyze situations.

In the high school test, understanding is demonstrated with the following indicators as well as by solving problems, reasoning, communicating, representing, and making connections based on the indicators—

- representing real life situations with algebraic expressions, equations, and inequalities, including exponential expressions and equations
- solving linear equations and inequalities in one variable
- evaluating expressions for given values
- recognizing and writing equivalent expressions
- graphing linear equations and writing equations that represent linear graphs
- graphing linear inequalities
- determining the slope and intercepts of a linear equation represented by a graph or an equation and interpreting the meaning of those values relative to the context of the problem
- solving two linear equations in two variables algebraically and graphically
- solving two linear inequalities in two variables graphically

Standard 2.3: Students demonstrate the ability to create models to represent mathematical relationships.

In the high school test, ability is demonstrated with the following indicators as well as by solving problems, reasoning, communicating, representing, and making connections based on the indicators—

- recognizing and creating multiple representations (e.g., words, charts, algebraic expression or equations, and graphic representations) of the same linear real life situations

See Standard 2.4 on the next page.

Standard 2.4: Students demonstrate an understanding of change in a variety of situations.

In the high school test, understanding is demonstrated with the following indicators as well as by solving problems, reasoning, communicating, representing, and making connections based on the indicators—

- analyzing various types of functions with regard to change, e.g., step functions, continuous linear functions, exponential functions, functions that increase (decrease) or do so over certain intervals
- determining in a mathematical or real life situation involving a constant or variable rate of change how a change in one variable affects the other variable

Strand 3: Geometry

Standard 3.1: Students demonstrate understanding of two- and three-dimensional geometric shapes and the relationships among them.

In the high school test, understanding is demonstrated with the following indicators as well as by solving problems, reasoning, communicating, representing, and making connections based on the indicators—

- reasoning about properties of classes of two- and three-dimensional geometric figures and the relationships among them
- justifying geometric statements through the use of deductive reasoning, particularly statements involving congruence and similarity
- finding counterexamples to disprove false geometric statements
- determining similarity of geometric figures
- using the sine, cosine, and tangent functions to find lengths and angle measures

Standard 3.2: Students demonstrate understanding of coordinate systems.

In the high school test, understanding is demonstrated with the following indicators as well as by solving problems, reasoning, communicating, representing, and making connections based on the indicators—

- analyzing properties of geometric figures using coordinate geometry, e.g., determining lengths of sides using the distance formula and determining whether adjoining sides are parallel or perpendicular using slopes

Standard 3.3: Students demonstrate understanding of symmetry and transformations.

In the high school test, understanding is demonstrated with the following indicators as well as by solving problems, reasoning, communicating, representing, and making connections based on the indicators—

- determining the image of a figure on the coordinate plane after a translation, reflection, rotation, or dilation
- describing the transformation or transformations (translation, reflection, rotation, and/or dilation) that transforms a figure to its image on the coordinate plane
- recognizing the connections between transformations and congruence, similarity, line symmetry, and rotational symmetry

Standard 3.4: Students demonstrate an ability to perform visual and spatial reasoning.

In the high school test, ability is demonstrated with the following indicators as well as by solving problems, reasoning, communicating, representing, and making connections based on the indicators—

- identify views (e.g., front, top, right side) and cross sections of a 3-dimensional structuring
- solving problems involving networks

Strand 4: Measurement

Standard 4.1: Students demonstrate understanding of concepts and processes of measurement.

In the high school test, understanding is demonstrated with the following indicators as well as by solving problems, reasoning, communicating, representing, and making connections based on the indicators—

- selecting the best measurement strategy to use relative to the purpose of the measurement and its required accuracy
- identifying the possible error in a measurement of area or volume
- using formulas to determine how a change in side length (radius or diameter) affects the area in triangles, parallelograms, and circles, and the surface area and volume of prisms, cylinders, pyramids, and spheres.
- performing conversions among derived units in the customary and metric systems, e.g., converting feet per minute to miles per hour

Standard 4.2: Students demonstrate facility with the tools, procedures, and formulas of measurement.

In the high school test, understanding is demonstrated with the following indicators as well as by solving problems, reasoning, communicating, representing, and making connections based on the indicators—

- solving problems involving rates and derived measurements
- estimating areas or volumes of irregular regions
- using given formulas to find the areas of figures that can be subdivided into rectangles, triangles, parallelograms, trapezoids, and/or circles
- using given formulas to find the surface areas and volumes of prisms, cylinders, cones, and pyramids as well as of regions that can be subdivided into these shapes
- solving problems involving the Pythagorean theorem, proportionality, and geometric similarity

Strand 5: Data Analysis and Probability

Standard 5.1: Students demonstrate facility in collecting, organizing, and displaying data.

In the high school test, facility is demonstrated with the following indicators as well as by solving problems, reasoning, communicating, representing, and making connections based on the indicators—

- designing experiments and surveys
- selecting appropriate graphic representations for data sets
- interpreting and constructing bar graphs, pictographs, line graphs, line plots, stem-and-leaf graphs, circle graphs, frequency charts, histograms, box-and-whisker graphs, and scatter plots
- recognizing how different representations of the same data sets can have affect their interpretation

Standard 5.2: Students demonstrate an understanding of statistical methods.

In the high school test, understanding is demonstrated with the following indicators as well as by solving problems, reasoning, communicating, representing, and making connections based on the indicators—

- calculating the mean, median, mean, and range of a data set and interpreting their meanings relative to the data set
- making judgments regarding the shape and spread of data sets, including consideration of outliers and quartiles
- determining how a change in a one or more data points in data sets affects statistics of the sets

Standard 5.3: Students demonstrate the ability to draw conclusions and make inferences based on data.

In the high school test, ability is demonstrated with the following indicators as well as by solving problems, reasoning, communicating, representing, and making connections based on the indicators—

- drawing conclusions and making inferences and predictions based on data given in charts and graphs
- drawing lines of best fit on scatter plots and using them to make predictions

Standard 5.4: Students demonstrate an understanding of probability.

In the high school test, understanding is demonstrated with the following indicators as well as by solving problems, reasoning, communicating, representing, and making connections based on the indicators—

- determining all possible outcomes for an experiment, using a tree diagram, an organized list, or, when appropriate, the fundamental counting principle
- finding theoretical probability involving independent and dependent events
- finding the empirical probability of an event, given a set of data
- making predictions based on probability